WHAT IS CLAIMED IS:

1. An image encoder comprising:

a filtering means for filtering an input image to generate subbands;

a bit plane generating means for dividing each of the subbands into code blocks of predetermined sizes to generate a bit plane ranging from the most significant bit (MSB) to least significant bit (LSB) in each of the code blocks;

a number-of-codes estimating means for estimating the number of codes in each bit plane;

a to-be-encoded object predicting means for predicting a to-be-encoded bit plane on the basis of the estimated number of codes;

a bit modeling means for making bit modeling of each of the to-be-encoded bit planes;

an encoding pass generating means for generating an encoding pass for each of the to-be-encoded bit planes;

an algebraic coding means for making algebraic coding within the encoding pass generated by the encoding pass generating means; and

a code stream generating means for generating a stream of codes using the algebraic code generated by the algebraic coding means.

2. The image encoder as set forth in claim 1, wherein the number-of-codes estimating means counts coefficients included in each bit plane and whose value is not "0" in the bit plane and is "0" in a bit plane above that bit plane to determine a first

count, and estimates the number of codes on the basis of the first count.

3. The image encoder as set forth in claim 2, wherein the number-of-codes estimating means counts coefficients included in each bit plane and whose value is not "0" in at least one bit plane above that bit plane to determine a second count, and adds a value resulted from multiplication of the first count by a first constant and a result of multiplication of the second count by a second constant to estimate the number of codes.

4. The image encoder as set forth in claim 3, wherein the number-of-codes estimating means normalizes the second count by a total number of coefficients in the code block for use.

5. The image encoder as set forth in claim 1, wherein the number-of-codes estimating means counts coefficients included in the bit plane or in at least one bit plane above that bit plane and whose value is not "0" and estimate the number of codes.

6. The image encoder as set forth in claim 1, wherein the to-be-encoded object predicting means adds the estimated number of codes in the order from a bit plane of MSB to a bit plane of LSB in all code blocks of the input image, stops the addition when a predetermined target number of codes is exceeded, and takes the bit planes whose estimated number of codes have been added together as the to-be-encoded bit planes.

7. The image encoder as set forth in claim 6, wherein the to-be-encoded object

predicting means adds the estimated number of codes in the order from the highest-frequency subband to lowest-frequency subband for the bit planes in the same bit positions.

8. The image encoder as set forth in claim 6, wherein the to-be-encoded object predicting means adds the estimated number of codes in the order from the brightness information component to color-difference information component for the bit planes in the same bit positions.

9. The image encoder as set forth in claim 1, wherein the to-be-encoded object predicting means calculates a reduction of distortion to be attained by encoding each bit plane, adds the estimated number of codes in the order from a bit plane for which the reduced amount of distortion per estimated number of codes is larger to a bit plane for which the reduced amount of distortion per estimated number of codes is smaller, stops the addition when a predetermined target number of codes is exceeded, and takes the bit planes whose estimated number of codes have been added together as the to-be-encoded bit planes.

10. An image encoder comprising:

a filtering means for filtering an input image to generate subbands;

a bit plane generating means for dividing each of the subbands into code blocks of predetermined sizes to generate a bit plane ranging from the most significant bit (MSB) to least significant bit (LSB) in each of the code blocks;

a number-of-codes estimating means for estimating the number of codes in each

encoding pass;

a to-be-encoded object predicting means for predicting a to-be-encoded encoding pass on the basis of the estimated number of codes in each encoding pass;

a bit modeling means for making bit modeling of each of the bit planes;

an encoding pass generating means for generating an encoding pass for each of the bit planes;

an algebraic coding means for making algebraic coding of the to-be-encoded one of the encoding passes within the encoding pass generated by the encoding pass generating means; and

a code stream generating means for generating a stream of codes using the algebraic code generated by the algebraic coding means.

11. An image encoding method comprising the steps of:

filtering an input image to generate subbands;

dividing each of the subbands into code blocks of predetermined sizes to generate a bit plane ranging from the most significant bit (MSB) to least significant bit (LSB) in each of the code blocks;

estimating the number of codes in each bit plane;

predicting a to-be-encoded bit plane on the basis of the estimated number of codes;

making bit modeling of each of the to-be-encoded bit planes;

generating an encoding pass for each of the to-be-encoded bit planes;

making algebraic coding within the encoding pass generated by the encoding pass generating step; and

generating a stream of codes using the algebraic code generated by the algebraic coding step.

12. An image encoding method comprising the steps of:

filtering an input image to generate subbands;

dividing each of the subbands into code blocks of predetermined sizes to generate a bit plane ranging from the most significant bit (MSB) to least significant bit (LSB) in each of the code blocks;

estimating the number of codes in each encoding pass;

predicting a to-be-encoded encoding pass on the basis of the estimated number of codes in each encoding pass;

making bit modeling of each of the bit planes;

generating an encoding pass for each of the bit planes;

making algebraic coding of the to-be-encoded one of the encoding passes within the encoding pass generated by the encoding pass generating step; and

generating a stream of codes using the algebraic code generated by the algebraic coding step.

13. A program allowing a computer to execute a predetermined process, the program comprising the steps of:

filtering an input image to generate subbands;

dividing each of the subbands into code blocks of predetermined sizes to generate a bit plane ranging from the most significant bit (MSB) to least significant bit (LSB) in each of the code blocks;

estimating the number of codes in each bit plane;

predicting a to-be-encoded bit plane on the basis of the estimated number of codes;

making bit modeling of each of the to-be-encoded bit planes;

generating an encoding pass for each of the to-be-encoded bit planes;

making algebraic coding within the encoding pass generated by the encoding pass generating step; and

generating a stream of codes using the algebraic code generated by the algebraic coding step.

14. A program allowing a computer to execute a predetermined process, the program comprising the steps of:

filtering an input image to generate subbands;

dividing each of the subbands into code blocks of predetermined sizes to generate a bit plane ranging from the most significant bit (MSB) to least significant bit (LSB) in each of the code blocks;

estimating the number of codes in each encoding pass;

predicting a to-be-encoded encoding pass on the basis of the estimated number of codes in each encoding pass;

making bit modeling of each of the bit planes;

generating an encoding pass for each of the bit planes;

making algebraic coding of the to-be-encoded one of the encoding passes within the encoding pass generated by the encoding pass generating step; and

generating a stream of codes using the algebraic code generated by the algebraic coding step.

15. A computer-readable recording medium having recorded therein a program allowing a computer to execute a predetermined process, the program comprising the steps of:

filtering an input image to generate subbands;

dividing each of the subbands into code blocks of predetermined sizes to generate a bit plane ranging from the most significant bit (MSB) to least significant bit (LSB) in each of the code blocks;

estimating the number of codes in each bit plane;

predicting a to-be-encoded bit plane on the basis of the estimated number of codes;

making bit modeling of each of the to-be-encoded bit planes;

generating an encoding pass for each of the to-be-encoded bit planes;

making algebraic coding within the encoding pass generated by the encoding pass generating step; and

generating a stream of codes using the algebraic code generated by the algebraic

coding step.

16. A computer-readable recording medium having recorded therein a program allowing a computer to execute a predetermined process, the program comprising the steps of:

filtering an input image to generate subbands;

dividing each of the subbands into code blocks of predetermined sizes to generate a bit plane ranging from the most significant bit (MSB) to least significant bit (LSB) in each of the code blocks;

estimating the number of codes in each encoding pass;

predicting a to-be-encoded encoding pass on the basis of the estimated number of codes in each encoding pass;

making bit modeling of each of the bit planes;

generating an encoding pass for each of the bit planes;

making algebraic coding of the to-be-encoded one of the encoding passes within the encoding pass generated by the encoding pass generating step; and

generating a stream of codes using the algebraic code generated by the algebraic coding step.